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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/609,487	07/01/2003	Oleg Kiselev	VRT0100US	1730

33031 7590 08/01/2005

CAMPBELL STEPHENSON ASCOLESE, LLP
4807 SPICEWOOD SPRINGS RD.
BLDG. 4, SUITE 201
AUSTIN, TX 78759

EXAMINER	
RUTZ, JARED IAN	

ART UNIT	PAPER NUMBER
2187	

DATE MAILED: 08/01/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/609,487	KISELEV ET AL.	
	Examiner	Art Unit	
	Jared I. Rutz	2187	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *01 July 2003*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-15* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-15* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *01 July 2003* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Claims 1-15 as originally filed on 7/01/2003 are pending in the instant application. Of these there are 5 independent claims and 10 dependent claims.

Claim Rejections - 35 USC § 112

1. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

2. **Claims 10 and 13** are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

3. **Claim 10** recites the limitation "the computer system" in line 2. There is insufficient antecedent basis for this limitation in the claim. It is unclear if the computer system refers to the first computer system or the second computer system.

4. **Claim 13** recites the limitation "the computer system" in line 17. There is insufficient antecedent basis for this limitation in the claim. It is unclear if the computer system refers to the first computer system or the second computer system.

Claim Rejections - 35 USC § 102

5. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

6. **Claims 1-5, 7-11, 13, and 15** are rejected under 35 U.S.C. 102(e) as being anticipated by Holt et al (US 2003/0145270).

7. **Claim 1** is taught by Holt as:

a. In a RAID data storage system comprising a stripe, wherein the stripe comprises stripe units B_1-B_{max}. See figure 3 which shows the striping of data across multiple disks.

b. A method comprising receiving a request to read data from stripe unit B_x, wherein B_x is one of stripe units B_1-B_{max}, wherein the request is received from a computer system in data communication with the RAID data storage system. See paragraph 0038 lines 6-13.

c. Reading stripe parity P corresponding to stripe units B_1-B_{max} in response to receiving the request. Paragraph 0038 lines 6-13 show that the data block and its associated CRC information are read. Paragraph 0036 lines 7-9 show that the CRC information is a form of parity bits. Paragraph 0022 shows that there is flexibility in the storage of CRC data, including combining the CRC data as a data block in the stripe. See also paragraph 0037 lines 3-6 which show that the CRC data may be interleaved with the user data.

d. Generating new stripe parity P_{new} corresponding to stripe units B_1-B_{max} as a function of data of each of the stripe units B_1-B_{max}; comparing the new stripe parity P_{new} with the stripe parity P. Paragraph 0038 lines 8-10 show that CRC is generated for the data read from the disk and compared against the stored CRC.

8. **Claim 2** is taught by Holt as:

e. Wherein the RAID data storage system comprises a parity RAID data storage system. See paragraph 0041 line 1.

9. **Claim 3** is taught by Holt as:

f. Wherein the parity RAID data storage system comprises a RAID 5 data storage system. See paragraph 0041 line 1.

10. **Claim 4** is taught by Holt as:

g. Returning stripe unit B_x data to the computer system if the stripe parity P compares equally to the new stripe parity P_{new}. See figure 1 item 70, which shows that if the new CRC and the old CRC match the data is considered valid.

11. **Claim 5** is taught by Holt as:

h. If stripe parity P does not compare equally to new stripe parity P_{new}: reading checksum CS data from memory wherein the checksum CS data corresponds to stripe units B_1-B_{max}. Paragraph 0038 lines 10-13 show that if the initial check fails the data may be reconstructed using the RAID parity data in a way known to someone skilled in the art. From paragraph

0026 of the instant application, it is shown that the checksum data may be parity data.

i. Generating new data for stripe unit B_y, one of the stripe units B_1-B_{max} as a function of checksum CS data and data of stripe units B_1-B_{max} other than stripe unit B_y. There is no limitation in the claim that B_y is not equal to B_x. Paragraph 0038 lines 10-12 show that the data of the block that is read (B_x) is reconstructed using the parity data of the RAID array, a form of checksum data.

j. Generating new checksum data CS_{new} as a function of the new data for stripe units B_1-B_{max} as a function of the new data for stripe unit B_y and data of stripe units B_1-B_{max} other than stripe unit B_y. See paragraph 0038 lines 12-13 which show that new checksum data is generated.

k. Comparing new checksum CS_{new} data with checksum CS data. Paragraph 0038 lines 12-13 show that CRC data is calculated for the reconstructed data and compared against the stored metadata.

l. Overwriting data of stripe unit B_y with the new data of stripe unit B_y if new checksum CS_{new} data compares equally to checksum CS data. Paragraph 0039 lines 13-17 shows that if the CRC generated for the reconstructed data matches the stored CRC it is presumed that the reconstructed data is correct. The reference only says that the reconstructed data is used. It does not explicitly say that the new data is

stored, but it is inherent that this is done either on the disk or in the data to be returned to the host computer system.

12. **Claim 7** is taught by Holt as:

m. A computer readable medium storing instructions executable by a first computer system in a RAID data storage system, wherein the RAID data system comprises a stripe, wherein the stripe comprises stripe units B_1-B_{max}, wherein the first computer system performs a method in response to executing instructions stored on the computer readable medium, the method comprising: reading a stripe parity P corresponding to stripe units B_1-B_{max} in response to receiving a request to read data from stripe unit B_x, wherein B_x is one of B_1-B_{max}, wherein the request is received from a second computer system in data communication with the first computer system; generating new stripe parity P_{new} corresponding to stripe units B_1-B_{max} as a function of data of each of the stripe units B_1-B_{max}; comparing the new stripe parity P_{new} with the stripe parity P. Paragraph 0040 lines 1-5 show that the process as taught with respect to claim 1 above may be implemented in software. See also paragraph 0032, which explains that the storage controller is a separate system from the host computer, thus providing a first and second computer system.

13. **Claim 8** is taught by Holt as:

n. Wherein the RAID data storage system comprises a parity RAID data storage system. See paragraph 0041 line 1.

14. **Claim 9** is taught by Holt as:

    o. Wherein the parity RAID data storage system comprises a RAID 5 data storage system. See paragraph 0041 line 1.

15. **Claim 10** is taught by Holt as:

    p. Wherein the method further comprises returning stripe unit B_x data to the computer system if the stripe parity P compares equally to the new stripe parity P_{new}. See figure 1 item 70, which shows that if the new CRC and the old CRC match the data is considered valid.

16. **Claim 11** is taught by Holt as:

    q. A computer readable medium performing the method described with respect to claim 5 above. Paragraph 0040 lines 1-5 show that the invention disclosed above may be implemented in software.

17. **Claim 13** is taught by Holt as:

    r. A data processing system comprising: a RAID data storage system comprising a stripe, wherein the stripe comprises stripe units B_1-B_{max}. See figure 3 which shows the striping of data across multiple disks.

    s. A first computer system (the RAID controller) for receiving a request to read data from stripe unit B_x wherein B_x is one of B_1-B_{max}, wherein the request is received from a second computer system (the host shown in paragraph 0032) in data communication with the first computer system, wherein the first computer system comprises a computer readable medium that stores instructions executable by the first computer system

(Paragraph 0040 lines 1-5) wherein the first computer system performs a method in response to receiving the request

t. The method comprising reading stripe parity P corresponding to stripe units B_1-B_{max} as a function of data of each of the stripe units B_1-B_{max}. See paragraph 0038 lines 6-8.

u. Generating new stripe parity P_{new} corresponding to stripe units B_1-B_{max} as a function of data of each of the stripe units B_1-B_{max}. Paragraph 0038 lines 8-10 show that CRC is generated for the data read from the disk.

v. Comparing stripe parity P_{new} with the stripe parity P. Paragraph 0038 lines 8-10 show that the CRC generated is compared to the stored CRC data.

w. Returning stripe unit B_x data to the computer system if the stripe parity P compares equally to the new stripe parity P_{new}. See figure 1 item 70, which shows that if the new CRC and the old CRC match the data is considered valid.

18. **Claim 15** is taught by Holt as:

x. A computer readable medium storing instructions executable by a first computer system in a RAID data storage system, wherein the RAID data storage system comprises a stripe, wherein the stripe comprises a plurality of stripe units B_1-B_n, wherein the first computer system performs a method in response to executing instructions stored on the computer readable medium, the method comprising: Paragraph 0040 lines 1-5 show that the process as disclosed may be implemented in software.

y. Generating parity P as a function of data from each of stripe units B_1-B_n of the stripe. This is inherent in the storage device being a RAID 5 as shown in paragraphs 0041 and 0042.

z. Storing parity P in stripe unit B_{n+1} of the stripe. This is inherent in the storage device being a RAID 5 as shown in paragraphs 0041 and 0042.

aa. Generating error correction data as a function of data from one of the stripe units B_1-B_n. See paragraph 0037, which shows that CRC may be generated as data is received by the controller.

bb. Storing the error correction data in memory. See paragraph 0037, which discusses where the CRC data may be stored.

19. **Claim 14** is rejected under 35 U.S.C. 102(e) as being anticipated by Talagala et al. (US 2003/0167439).

20. Examiner acknowledges the use of 112 6th paragraph "means for" language.

21. **Claim 14** is taught by Talagala as:

cc. A data processing system comprising: a RAID data storage system comprising a stripe, wherein the stripe comprises stripe units B_1-B_{max}. See figure 2 which shows the striping of data across multiple disks.

dd. Means for receiving a request to read data from stripe unit B_x, wherein B_x is one of B_1-B_{max}, wherein the request is received from a computer system in data communication with the RAID data storage system. Paragraph 0025 of the instant application recites that "the RAID controller 18 may

receive a request". Array controller (figure 1 item 112) is an equivalent structure providing a means for receiving.

ee. Means for reading stripe parity P corresponding to stripe units B_1-B_{max} in response to receiving the request. Paragraph 0027 of the instant application recites that "Raid controller 18 reads existing data"". Array controller (figure 1 item 112) is an equivalent structure providing a means for reading.

ff. Means for generating new stripe parity P_{new} corresponding to stripe units B_1-B_{max} as a function of data of each of the stripe units B_1-B_{max}. Paragraph 0025 of the instant application recites that "the RAID controller 18 generates new parity". Array controller (figure 1 item 112) is an equivalent structure providing a means for generating.

gg. Means for comparing the new stripe parity P_{new} with the stripe parity P. Paragraph 0029 of the instant application recites that "the RAID controller 18 compares the newly generated parity". Array controller (figure 1 item 112) is an equivalent structure providing a means for comparing.

hh. Means for returning stripe unit B_x data to the computer system if the stripe parity P compares equally to the new stripe parity P_{new}. Paragraph 0030 of the instant application recites that "RAID controller returns data". Array controller (figure 1 item 112) is an equivalent structure providing a means for receiving.

22. **Claims 1-5, 7-11, 13, and 15** are further rejected under 35 U.S.C. 102(e) as being anticipated by Talagala.

23. **Claim 1** is taught by Talagala as:

ii. In a RAID data storage system comprising a stripe, wherein the stripe comprises stripe units B_1-B_{max}. See figure 2 which shows the striping of data across multiple disks.

jj. A method comprising receiving a request to read data from stripe unit B_x, wherein B_x is one of stripe units B_1-B_{max}, wherein the request is received from a computer system in data communication with the RAID data storage system. See paragraph 0035 lines 3-6.

kk. Reading stripe parity P corresponding to stripe units B_1-B_{max} in response to receiving the request. Paragraph 0037, which shows the reading of all the checksums relating to a stripe, referred to as a vertical relationship.

ll. Generating new stripe parity P_{new} corresponding to stripe units B_1-B_{max} as a function of data of each of the stripe units B_1-B_{max}; comparing the new stripe parity P_{new} with the stripe parity P. See paragraph 0037, which show that vertical relationship parity data corresponding to all the stripe units is generated and compared.

24. **Claim 2** is taught by Talagala as:

mm. Wherein the RAID data storage system comprises a parity RAID data storage system. See paragraph 0021 lines 1-3.

25. **Claim 3** is taught by Talagala as:

nn. Wherein the parity RAID data storage system comprises a RAID 5 data storage system. See paragraph 0021 lines 1-3.

26. **Claim 4** is taught by Talagala as:

oo. Returning stripe unit B_x data to the computer system if the stripe parity P compares equally to the new stripe parity P_{new}. See paragraph 0048 lines 6-9, which show that if there is no error in the vertical relationship parity, it is concluded that the stripe unit contains valid data.

27. **Claim 5** is taught by Talagala as:

pp. If stripe parity P does not compare equally to new stripe parity P_{new}: reading checksum CS data from memory wherein the checksum CS data corresponds to stripe units B_1-B_{max}. Paragraph 0048 lines 1-6 show that if the initial check of the vertical parity fails the horizontal parity may be checked. From paragraph 0026 of the instant application, it is shown that the checksum data may be parity data.

qq. Generating new data for stripe unit B_y, one of the stripe units B_1-B_{max} as a function of checksum CS data and data of stripe units B_1-B_{max} other than stripe unit B_y. There is no limitation in the claim that B_y is not equal to B_x. Paragraph 0049 shows that the data of the block that is read may be reconstructed using the parity data of the RAID array, a form of checksum data.

rr. Generating new checksum data CS_{new} as a function of the new data for stripe units B_1-B_{max} as a function of the new data for stripe unit B_y and data

of stripe units B_1-B_{max} other than stripe unit B_y. See paragraph 0049 lines 4-5 which show that new data B_y is compared to the original checksum, in order to do this it is inherent that the checksum value of the new data B_y is generated.

ss. Comparing new checksum CS_{new} data with checksum CS data. See paragraph 0049 lines 4-5 which show that the new checksum data is compared to the stored checksum data.

tt. Overwriting data of stripe unit B_y with the new data of stripe unit B_y if new checksum CS_{new} data compares equally to checksum CS data. Paragraph 0049 lines 5-9 show that if the CRC generated for the reconstructed data matches the stored CRC it is presumed that the reconstructed data is correct and replaces the old data.

28. **Claim 6** is taught by Talagala as:

uu. Further comprising changing the value of variable y and repeating (a)-(d) if new checksum CS_{new} data does not compare equally with checksum CS data. See paragraph 0036 and figures 4a-4e, which show that if a single data integrity error is detected, the other blocks are checked.

29. **Claim 7** is taught by Talagala as:

vv. A computer readable medium storing instructions executable by a first computer system in a RAID data storage system, wherein the RAID data system comprises a stripe, wherein the stripe comprises stripe units B_1-B_{max}, wherein the first computer system performs a method in response to

executing instructions stored on the computer readable medium, the method comprising: reading a stripe parity P corresponding to stripe units B_1-B_{max} in response to receiving a request to read data from stripe unit B_x, wherein B_x is one of B_1-B_{max}, wherein the request is received from a second computer system in data communication with the first computer system; generating new stripe parity P_{new} corresponding to stripe units B_1-B_{max} as a function of data of each of the stripe units B_1-B_{max}; comparing the new stripe parity P_{new} with the stripe parity P. Paragraph 0008 shows that the process as taught with respect to claim 1 above may be implemented in software. See also figure 1 which shows the storage system as being separate from the host, thus providing a first and second computer system.

30. **Claim 8** is taught by Talagala as:

ww. Wherein the RAID data storage system comprises a parity RAID data storage system. See paragraph 0021 lines 1-3.

31. **Claim 9** is taught by Talagala as:

xx. Wherein the parity RAID data storage system comprises a RAID 5 data storage system. See paragraph 0021 lines 1-3.

32. **Claim 10** is taught by Talagala as:

yy. Wherein the method further comprises returning stripe unit B_x data to the computer system if the stripe parity P compares equally to the new stripe parity P_{new}. Paragraph 0049 says that the old data is replaced by the new

data. As the data unit was originally read in response to a read request from the host, it is inherent that the repaired data is returned to the host.

33. **Claim 11** is taught by Talagala as:

zz. A computer readable medium performing the method described with respect to claim 5 above. Paragraph 0008 shows that the disclosed invention may be implemented in software.

34. **Claim 12** is taught by Talagala as:

aaa. Further comprises changing the value of variable y and repeating (a)-(d) if new checksum CS_{new} data does not compare equally with checksum CS data. See paragraph 0036 and figures 4a-4e, which show that if a single data integrity error is detected, the other blocks are checked.

35. **Claim 13** is taught by Talagala as:

bbb. A data processing system comprising: a RAID data storage system comprising a stripe, wherein the stripe comprises stripe units B_1-B_{max}. See figure 2 which shows the striping of data across multiple disks.

ccc. A first computer system (see figure 1 item 112) for receiving a request to read data from stripe unit B_x wherein B_x is one of B_1-B_{max}, wherein the request is received from a second computer system (figure 1 item 102) in data communication with the first computer system, wherein the first computer system comprises a computer readable medium that stores instructions executable by the first computer system (Paragraph

0008) wherein the first computer system performs a method in response to receiving the request

ddd. The method comprising reading stripe parity P corresponding to stripe units B_1-B_{max} as a function of data of each of the stripe units B_1-B_{max}. See Paragraph 0037.

eee. Generating new stripe parity P_{new} corresponding to stripe units B_1-B_{max} as a function of data of each of the stripe units B_1-B_{max}. See paragraph 0037 lines 4-8.

fff. Comparing stripe parity P_{new} with the stripe parity P. See paragraph 0037, which show that vertical relationship parity data corresponding to all the stripe units is generated and compared.

ggg. Returning stripe unit B_x data to the computer system if the stripe parity P compares equally to the new stripe parity P_{new}. Paragraph 0049 says that the old data is replaced by the new data. As the data unit was originally read in response to a read request from the host, it is inherent that the repaired data is returned to the host.

36. **Claim 15** is taught by Talagala as:

hhh. A computer readable medium storing instructions executable by a first computer system in a RAID data storage system, wherein the RAID data storage system comprises a stripe, wherein the stripe comprises a plurality of stripe units B_1-B_n, wherein the first computer system performs a method in response to executing instructions stored on the computer

readable medium, the method comprising: Paragraph 0008 shows that the disclosed invention may be implemented in software.

iii. Generating parity P as a function of data from each of stripe units B_1-B_n of the stripe. See paragraph 0034 lines 1-2.

jjj. Storing parity P in stripe unit B_{n+1} of the stripe. See 0034 line 8 which shows that the checksum can be stored in the array.

kkk. Generating error correction data as a function of data from one of the stripe units B_1-B_n. See paragraph 0034..

lll. Storing the error correction data in memory. See paragraph 0034, which discusses where the checksum data may be stored.

Conclusion

37. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Morrison (US 6,687,791) teaches a system for detecting and correcting errors in a RAID system using both parity data and additional checksum data. Gaskins et al (US 5,463,643) teaches the use of a RAID like system for memory using two types of parity data to detect and correct data errors.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jared I. Rutz whose telephone number is (571) 272-5535. The examiner can normally be reached on M-F 8:00 AM - 4:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Donald Sparks can be reached on (571) 272-4201. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

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Jared I Rutz
Examiner
Art Unit 2187

/jir JIR

CHRISTIAN CHACE
PRIMARY EXAMINER